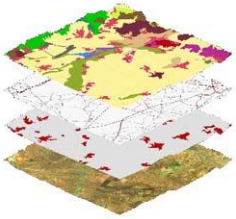

Object Based Image Analysis (OBIA)

Study case 1

MAPPING EUCALYPTUS TREE PLANTATIONS in NW Spain

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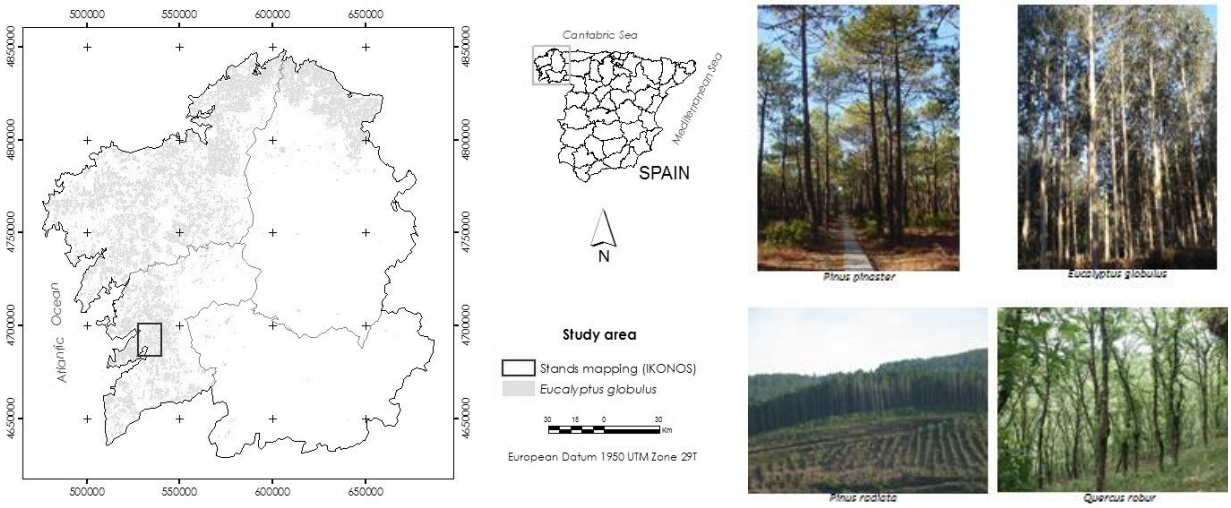
GENERAL OBJECTIVE

Identify and map Eucalyptus tree plantations in NW Spain, using high spatial resolution imagery (IKONOS) and OBIA. The classification has to be validated and exported.



OBIA OBJECTIVES

1. Project creation
2. Data loading
3. Pre-processing
4. Segmentation
5. Supervised classification using training areas (TTA)
6. Quality assessment (using an independent sample)
7. Supervised classification with training areas (TTA)
8. Discussion of the results
9. Export

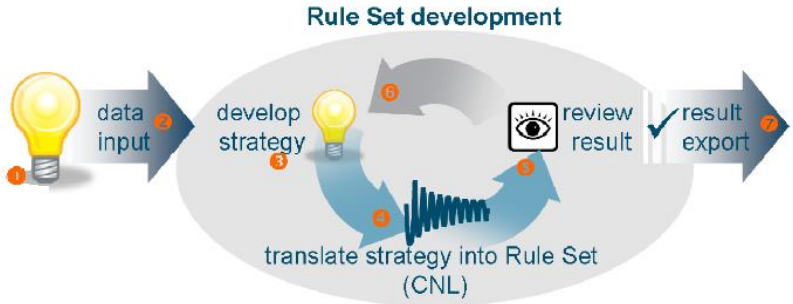
DATA

IMAGE	CHARACTERISTICS
IKONOS_Pontevedra_corregida.img	12.3 km × 17.3 km Geo 4 IKONOS multispectral 04/07/2003. Resampling: NN. 16 bits. Without atmospheric corrections (DN).
ttamask_cal_ec_2010.tiff	Training areas. 12 classes.
validacion_ikonos.png	Validation samples. 10 classes.

Samples:

ID	Val	Class	Training	Validatión
			n	npv
W	1	Water	140	38
I	2	Infrastructures (urban areas, roads)	254	63
LC	4	Low cover (newly afforested areas, unproductive areas)	83	48
AG	3	Agricultural land (grasslands, vineyards, farming areas)	155	100
SH	5	Shrub rangeland	82	31
PI	9	Pine forest land	104	84
OA	6	Oak forest land	56	61
AL	7	*Alnus glutinosa* forest land	55	80
EU	8	*Eucalyptus globulus* stands	67	183

STUDY CASE



1. Understand the general idea of the analysis
2. Choose the data
3. Develop a strategy
4. Translate the strategy into a rule set
5. Review the results
6. (Refine the strategy and rules)
7. Export the results

GENERAL IDEA

... we should think about what general and consistent characteristics are contained in:

- The data
- The object shape
- If there are any context-based characteristics

DEVELOP A STRATEGY

Pre-processing? (Creating new bands?)

Segmentation? (Type?)

Classification: Type? Number of classes? Algorithm (parameters)?

Validation (quality assessment): confusion matrix?, stability?

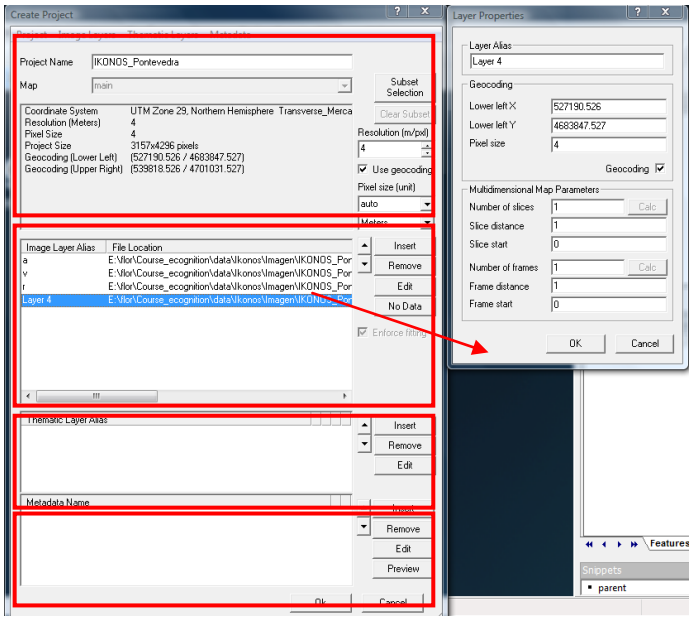
Results to export (vector file? Extra variables?)

TRANSLATE THE STRATEGY INTO A RULE SET

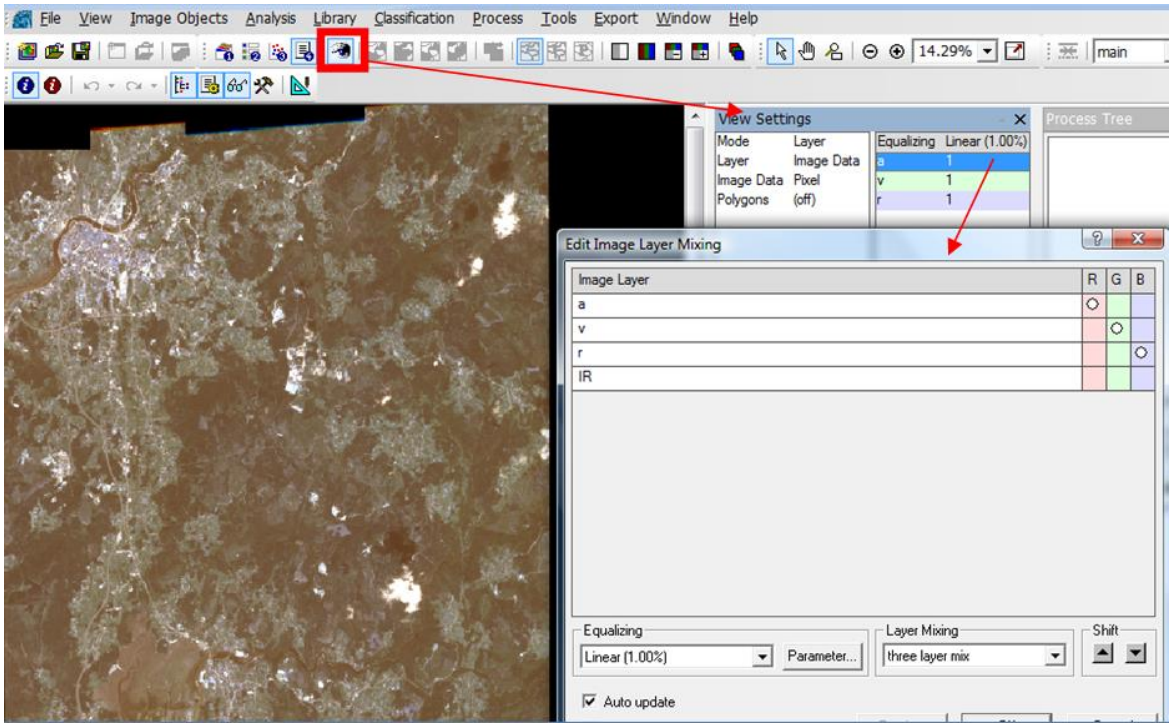
1. Import data

Create a project. Load the image and check its characteristics.

Aliases to automatize the processes: B1= BLUE, B2= GREEN, B3= RED, B4= IR.



Change the visualization settings.



2. Segmentation.

How can we choose the most suitable method) Review the basics

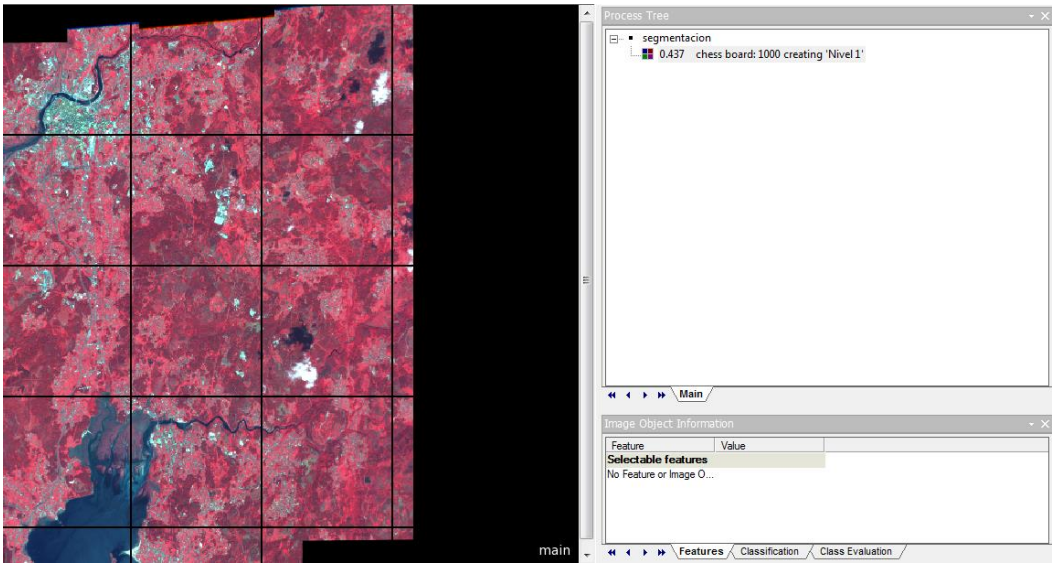
Critical values: weight, scale parameter, homogeneity criterion

Compare the results after using different values (i.e. scale parameter)

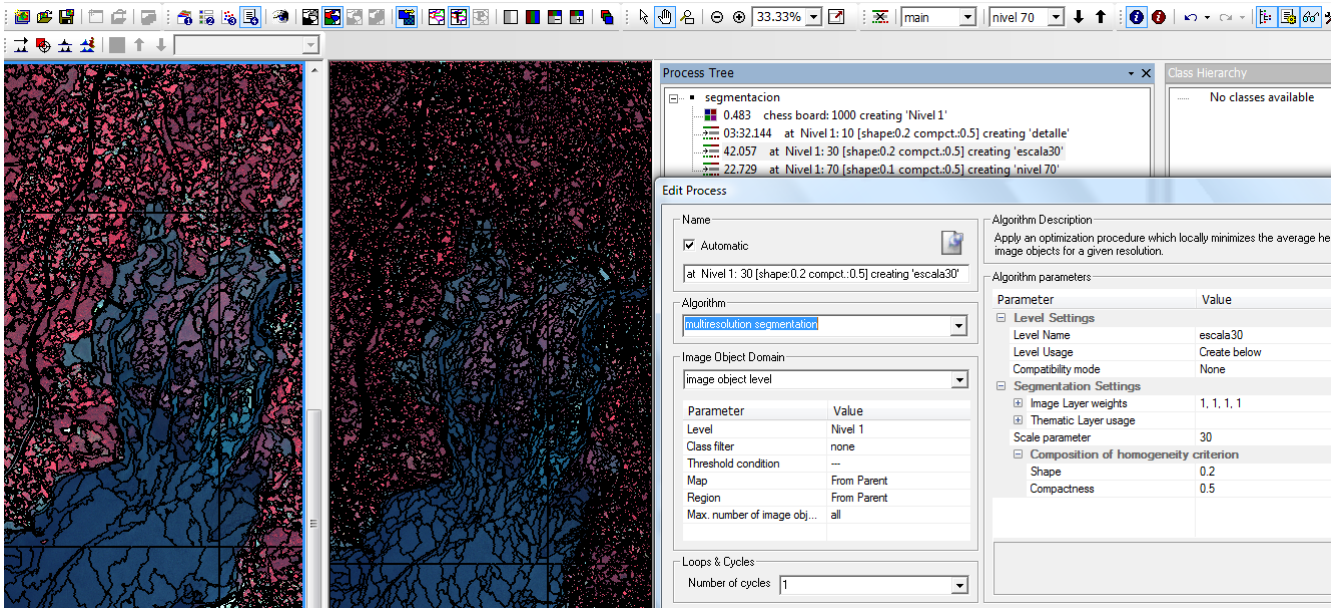
- Suggestion: chessboard segmentation + multiresolution segmentation

Insert the process in the process tree (segmentation) (*Append new*)

Insert the segmentation algorithm as a dependent process (*Insert child*)



Multiresolution segmentation



Run multiresolution segmentations with the following scale parameters: 10 (Level10), 30 (Level 30), 50 (Level 50) and 70 (Level 70) (Use the objects from the chessboard segmentation as a base).

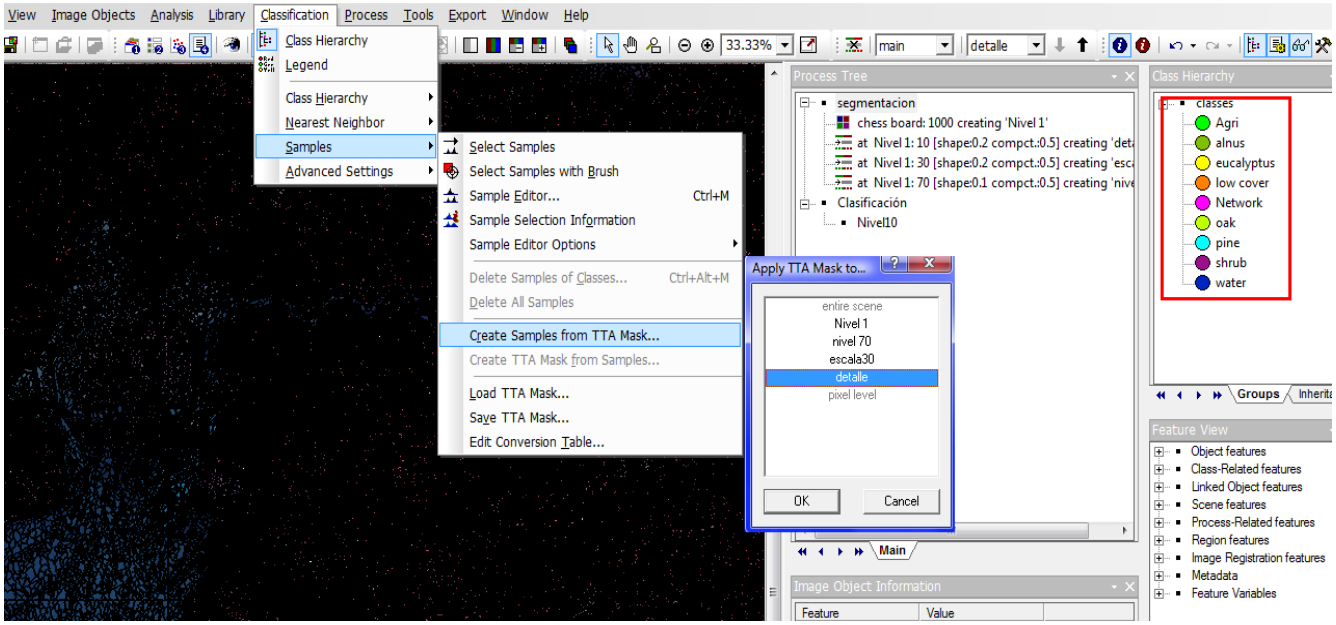
Compare the results and processing times.

3. Classification

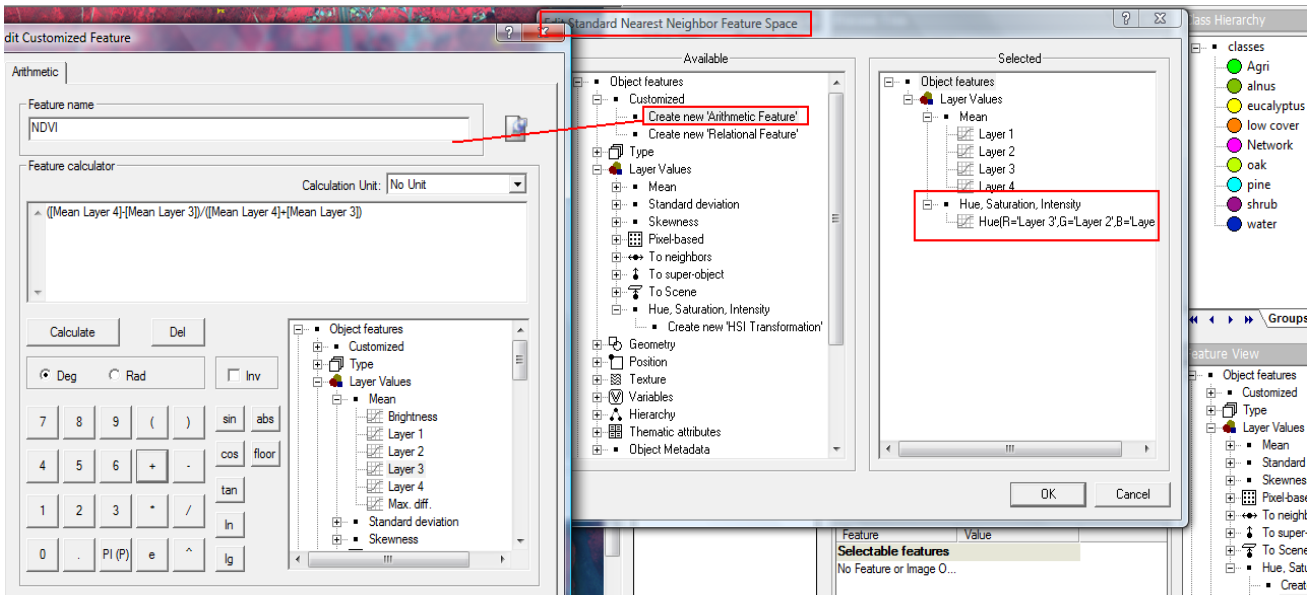
Choose the method and algorithm.

Data availability.

- Suggestion: Supervised classification using NN.
    - Import the TTA mask and create class hierarchy. (*Classification/ Samples/ Load TTA mask)*
    - Edit the class hierarchy to eliminate the classes we do not need (3).
    - Edit the conversion table samples/classes (*Classification/ Samples/Edit conversion table)*
    - Convert the TTA mask into samples (Level 10). Overlap: 0.75.

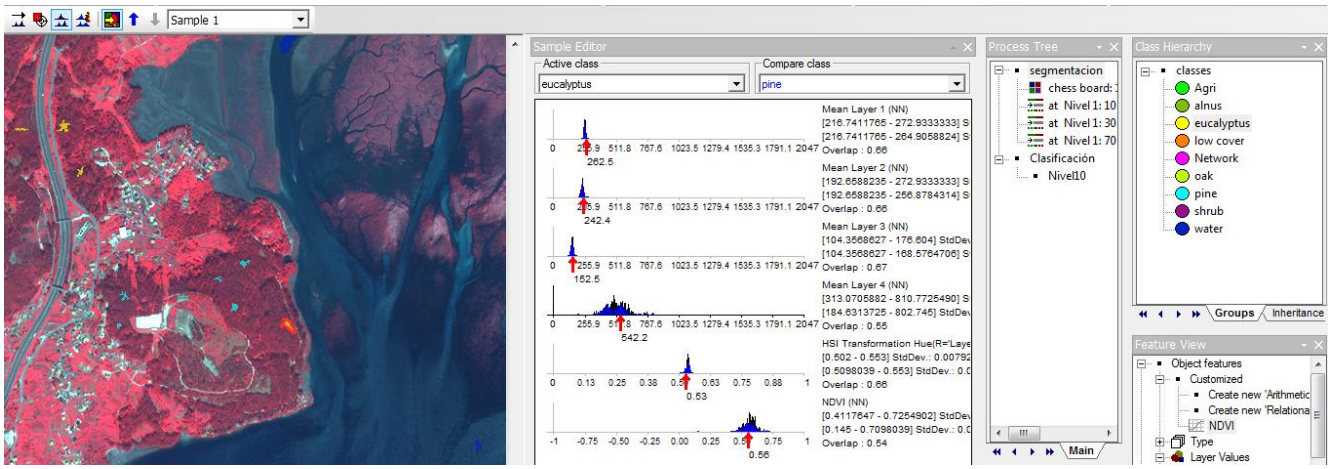


- Definition of the *feature space:*
    - R, G, B, NIR, transformation HSI, NDVI
    - Assign the *feature space* to all the classes

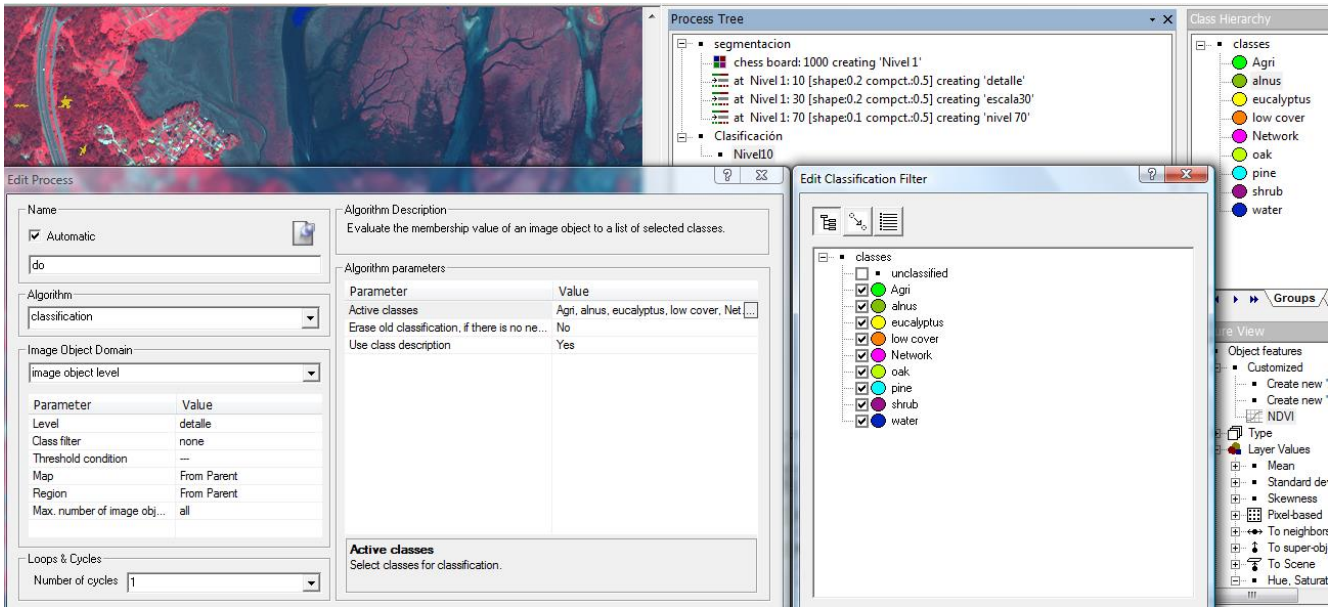


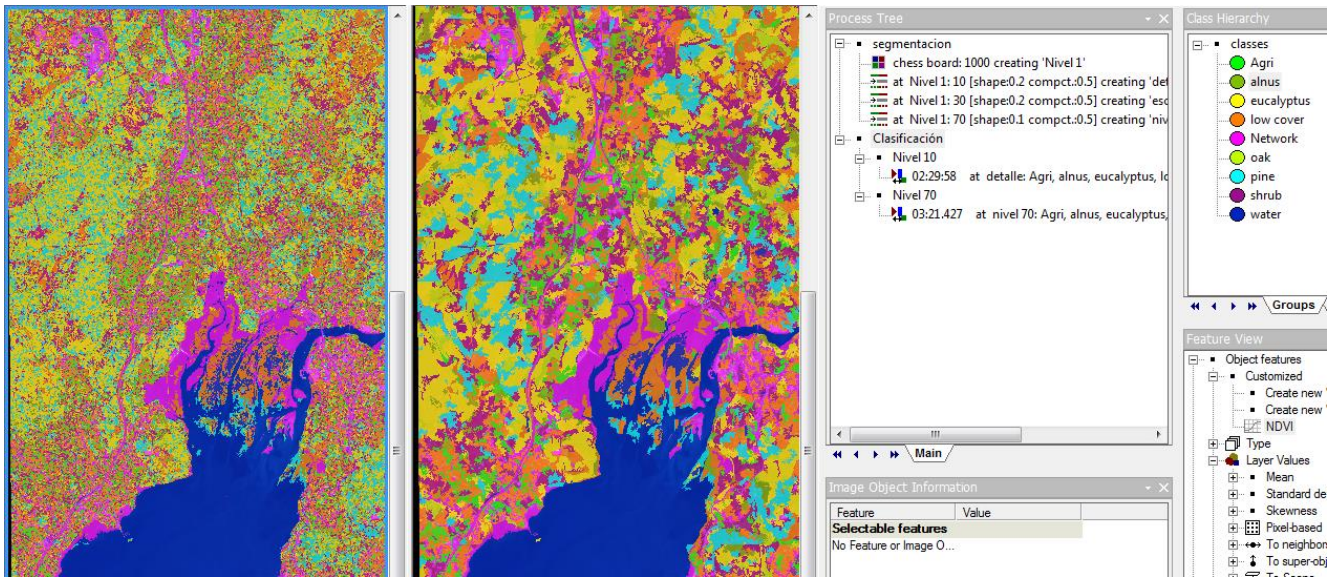
- Set a minimum membership value: 0.5 (*classification/ advanced settings/)*

- Run an exploratory analysis of the samples (separability, etc) (*Sample editor)*



- Insert the classification process in the *process tree*. (*Insert child)*. Classification of all the classes at Level10.

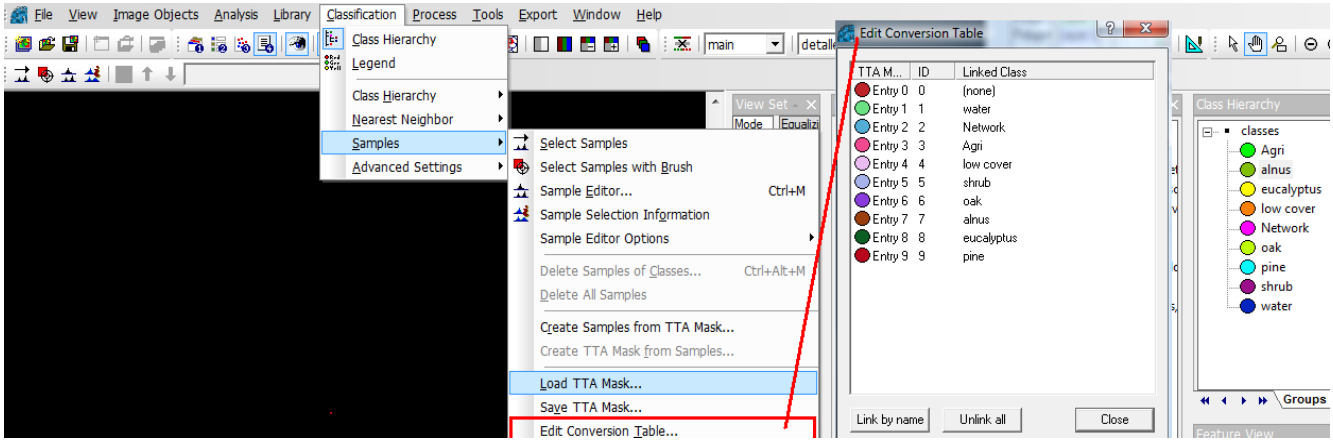




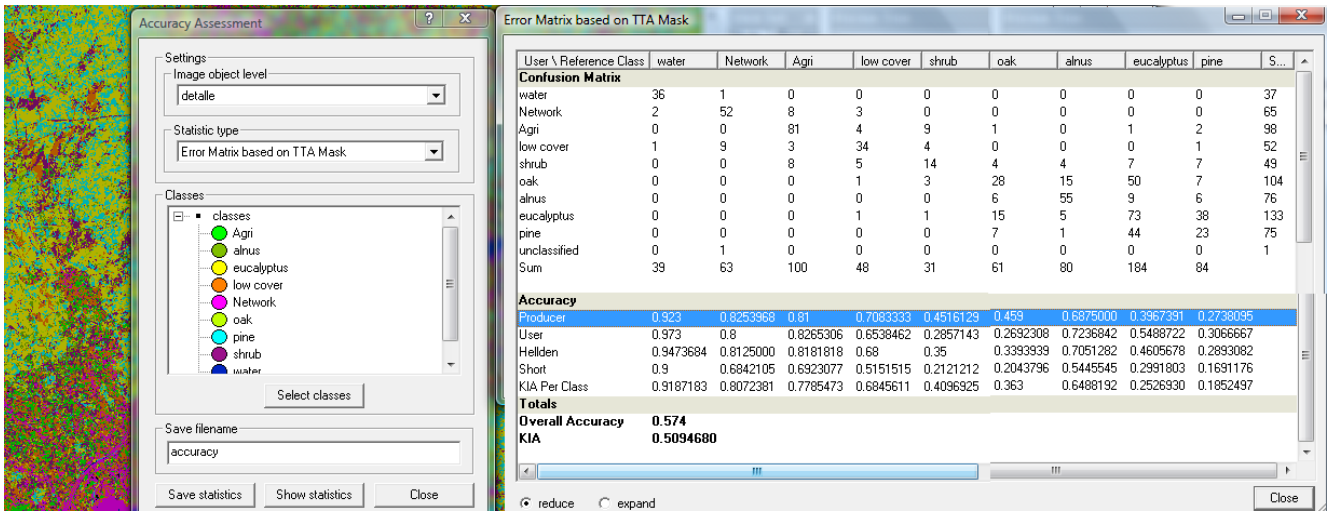
Classification at the other levels using the same samples

Compare the results

4. Accuracy assessment
   - Confusion Matrix:
     - Import the TTA mask with the validation samples (*Classification/ Samples/ Load TTA mask*). Edit the conversion table to show how it corresponds with the hierarchy (*Classification/ Samples/ Edit conversion table*). (Level 10)

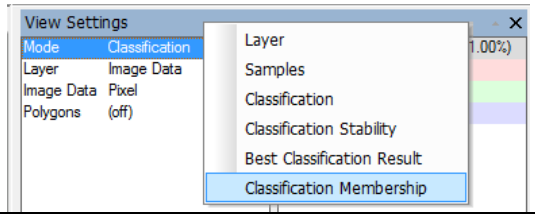


     - Create the confusion matrix: *Tools/ Accuracy Assessment/ Error Matrix based on TTA mask* (Level10).

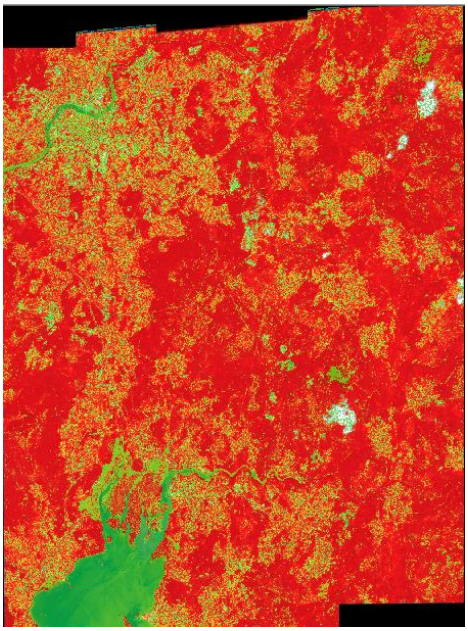


User \ Reference Class	water	Network	Agri	low cover	shrub	oak	alnus	eucalyptus	pine	S...
Confusion Matrix										
water	36	1	0	0	0	0	0	0	0	37
Network	2	52	8	3	0	0	0	0	0	65
Agri	0	0	81	4	9	1	0	1	2	98
low cover	1	9	3	34	4	0	0	0	1	52
shrub	0	0	8	5	14	4	4	7	7	49
oak	0	0	0	1	3	28	15	50	7	104
alnus	0	0	0	0	0	6	55	9	6	76
eucalyptus	0	0	0	1	1	15	5	73	38	133
pine	0	0	0	0	0	7	1	44	23	75
unclassified	0	1	0	0	0	0	0	0	0	1
Sum	39	63	100	48	31	61	80	184	84	
Accuracy										
Producer	0.923	0.8253968	0.81	0.7083333	0.4516129	0.459	0.6875000	0.3967391	0.2738095	
User	0.973	0.8	0.8265306	0.6538462	0.2857143	0.2692308	0.7236842	0.5488722	0.3066667	
Hellden	0.9473684	0.8125000	0.8181818	0.68	0.35	0.3393939	0.7051282	0.4605678	0.2893082	
Short	0.9	0.6842105	0.6923077	0.5151515	0.2121212	0.2043796	0.5445545	0.2991803	0.1691176	
KIA Per Class	0.9187183	0.8072381	0.7785473	0.6845611	0.4096925	0.363	0.6488192	0.2526930	0.1852497	
Totals										
Overall Accuracy	**0.574**									
KIA	**0.5094680**									

   - Compute the stability of the classification: *Tools/ Accuracy Assessment/ Classification stability*
   - Visualize the *classification membership* and the rest of quality indicators using *View Settings/ Mode*



Results: Classification stability (left), *Classification Membership*(right)

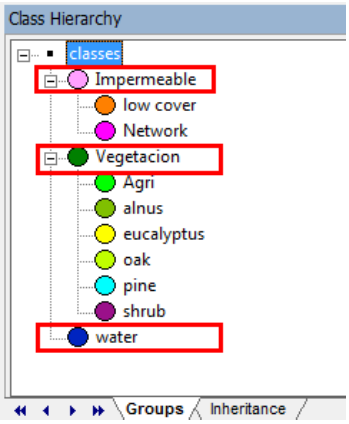


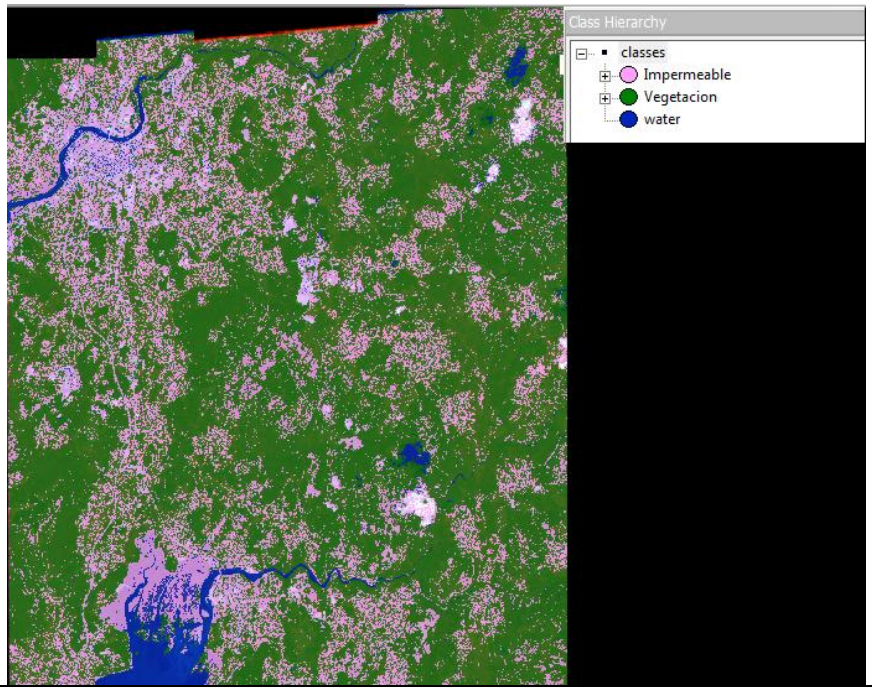
5. Discussion of the results

Need and possibility of improving the results. Strategies.

Establish a work flow.

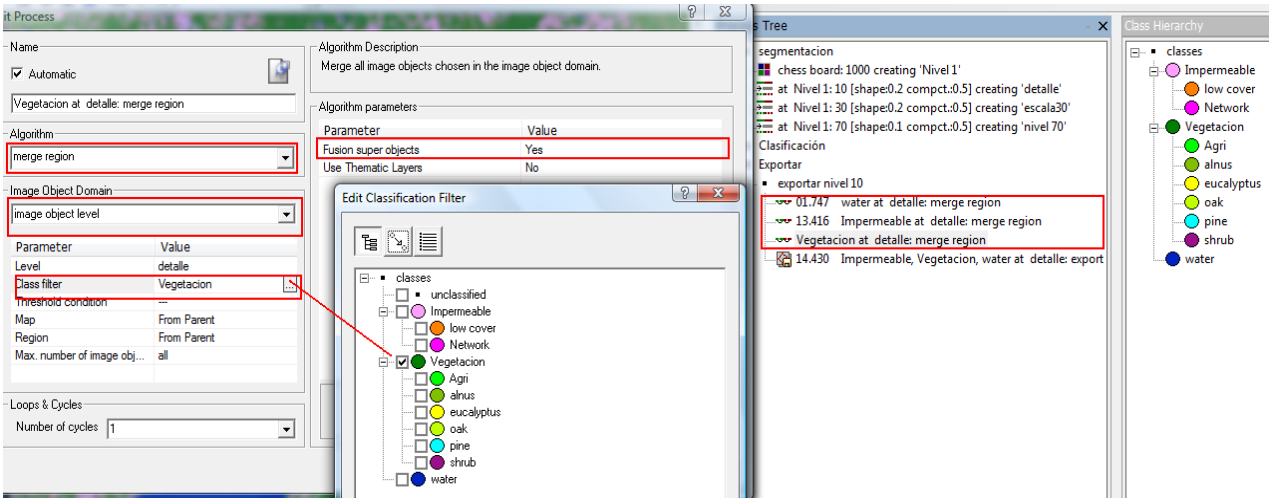
6. Group the classes into 3 main categories: *Water, Impervious, Vegetation*
   - Create the categories *Impervious* and *Vegetation* (*Class Hierarchy/ Groups)*
   - Drag the existing classes to the new categories.
   - Collapse or expand the class hierarchy to check the different grouping options.



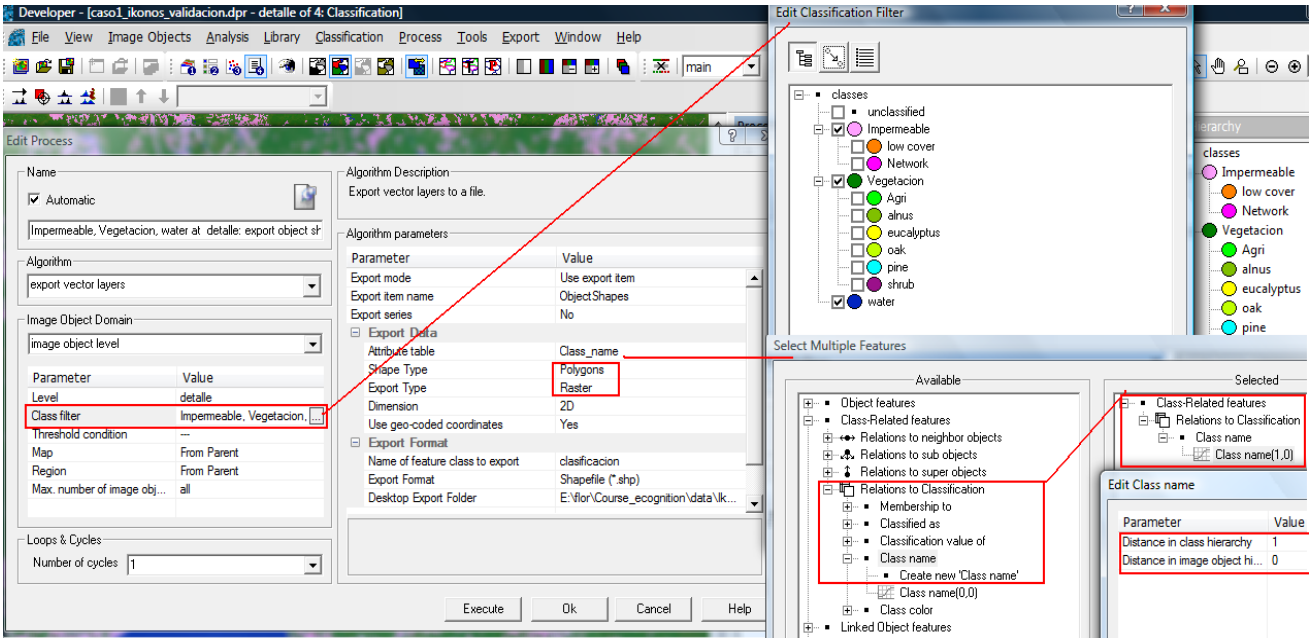


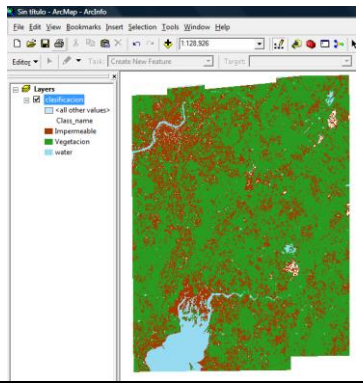
7. Export the results

- Merge the objects of each category (in the same level 10): *Water, Impervious, Vegetation. (Process Tree/ Merge regions)*



- Export the vector file with the classification.
  - Insert a new process in the tree: *export vector layers.*
  - Create attributes to export (class name): *Attribute table/Relations to classification/Class name.*
  - *Class filter:* choose the classes to export.
  - Export as *shp*.





Export only the Eucalyptus tree stands.

Add the other attributes to the table

Load the file into a GIS.